AMENDMENTS TO THE CLAIMS

1. (Original) A fiber optic tmperature sensor for measuring temperatures in a measurement range from less than -200° C to substantially beyond about 1,100° C, comprising:

a rigid sensor body of a heat-dissipating material;

a hollow tip member extending from the sensor body, the hollow tip member being made of a material capable of withstanding temperatures in the measurement range; and

an optical fiber disposed within the tip member, the optical fiber being made of a material capable of withstanding temperatures in the measurement range, the optical fiber terminating in a selectively reflective fiber Bragg grating made of materials capable of withstanding temperatures in the measurement range.

- 2. (Original) A fiber optic temperature sensor according to claim 1, wherein the optical fiber comprises sapphire.
- 3. (Original) A fiber optic temperature sensor according to claim 1, wherein the optical fiber comprises zirconia.
- 4. (Original) A fiber optic temperature sensor according to claim 3, wherein the zirconia is stabilized with yttria.
- 5. (Original) A fiber optic temperature sensor according to claim 1, wherein the fiber Bragg grating comprises layers of yttria-stabilized zirconia, wherein alternating layers have different concentrations of yttria to provide a desired difference of refractive index.

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(Original) A fiber optic temperature sensor according to claim 6.

1, wherein the fiber Bragg grating comprises alternating layers of

alumina and zirconia.

(Original) A fiber optic temperature sensor according to claim 7.

1, wherein the tip member comprises ceramic.

(Original) A fiber optic temperature sensor according to claim 8.

1, wherein the sensor body comprises a metal sleeve from which the

tip member extends.

(Original) A fiber optic temperature sensor according to claim

8, wherein the metal sleeve and the tip member of the sensor body

are attached together by high-temperature cement.

(Original) A fiber optic temperature sensor according to claim 10.

8, wherein the metal sleeve comprises copper.

(Original) A fiber optic temperature sensor according to claim 11.

1, wherein the optical fiber is a first optical fiber, and further

comprising a second optical fiber having one end disposed within

the sensor body and optically coupled to the first optical fiber.

(Original) A fiber optic temperature sensor according to claim 12.

11, wherein the second optical fiber is butt-joined to the first

optical fiber with an anti-reflective coating interposed

therebetween.

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(Original) A fiber optic temperature sensor according to claim 13.

11, wherein the second optical fiber comprises silica.

(Original) A fiber optic temperature sensor according to claim 14.

11, wherein the second optical fiber is disposed within a rugged

jacket, and wherein the jacket is disposed within the sensor body

in a manner retaining the second fiber within the sensor body.

(Original) A fiber optic temperature sensor according to claim

14, wherein the metal sleeve and the tip member of the sensor body

are attached together by high-temperature cement.

16. (Original) Α system for measuring temperatures

measurement range from less than -200° C to substantially beyond

about 1,100° C, comprising:

a fiber optic temperature sensor having a tip portion with an

optical fiber therein, the optical fiber being made of a material

capable of withstanding temperatures in the measurement range, the

optical fiber terminating in a fiber Bragg grating made of

materials capable of withstanding temperatures in the measurement

range and having reflectivity which is a function of wavelength of

incident light;

a broadband light source being optically coupled to the

optical fiber to transmit light along the optical fiber toward the

fiber Bragg grating;

an optical spectrum analyzer optically coupled to the optical

fiber to receive light reflected from the fiber Bragg grating back

into the optical fiber; and

a processor operative to receive one or more electrical

signals from the optical spectrum analyzer representing the

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intensity of the reflected light across an optical spectrum

including an optical wavelength at which an optical characteristic

of the fiber Bragg grating is detected, the processor being further

operative to determine a value of the optical wavelength at which

the optical characteristic of the fiber Bragg grating is detected

and to convert the determined wavelength value to a temperature

value according to predetermined conversion criteria.

(Original) A temperature-measuring system according to claim 17.

16, wherein the optical fiber comprises sapphire.

(Original) A temperature-measuring system according to claim 18.

16, wherein the optical fiber comprises zirconia.

(Original) A temperature-measuring system according to claim 19.

18, wherein the zirconia is stabilized with yttria.

(Original) A temperature-measuring system according to claim 20.

16, wherein the fiber Bragg grating comprises layers of yttria-

stabilized zirconia, wherein alternating layers have different

concentrations of yttria to provide a desired difference of

refractive index.

21. (Original) A temperature-measuring system according

claim 16, wherein the fiber Bragg grating comprises alternating

layers of alumina and zirconia.

(Original) A temperature-measuring system according 22.

claim 16, wherein the optical fiber is a first optical fiber,

and further comprising a second optical fiber operative to

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optically couple the temperature sensor to the light source and

the optical spectrum analyzer, the second optical fiber having

one end disposed within the temperature sensor and optically

coupled to the first optical fiber.

23. (Original) A temperature-measuring system according

claim 22, wherein the second optical fiber is butt-joined to the

first optical fiber with an anti-reflective coating interposed

therebetween.

24. (Original) A temperature-measuring system according to claim

22, wherein the second optical fiber comprises silica.

25. (Original) A temperature-measuring system according to claim

22, further comprising an optical coupler having one bidirectional

optical port coupled to the second optical fiber, the optical

coupler having a light input optical port coupled to the light

source and a light output optical port coupled to the optical

spectrum analyzer.

(Original) A temperature-measuring system according to claim

16, wherein the optical spectrum analyzer comprises a photodetector

array.

27. (Original) A temperature-measuring system according to claim

wherein the photodetector array comprises a charge-coupled

device array.

(Original) A temperature-measuring system according to claim 28.

16, wherein the optical characteristic is peak reflectivity.

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29. (Original) A temperature-measuring system according to claim 16, wherein the processor is operative when determining the value of the optical wavelength at which the optical characteristic of the fiber Bragg grating is detected to:

i) obtain and normalize measured spectrum data from the optical spectrum analyzer when the system is operating at a measurement temperature; and

ii) compute an amount by which the normalized measured spectrum data must be shifted in wavelength to yield shifted normalized measured spectrum data in which the optical characteristic is most similar to the same optical characteristic in pre-established reference spectrum data.

30. (Original) A temperature-measuring system according to claim 29, wherein computing the amount by which the normalized measured spectrum data must be shifted comprises (i) calculating a difference function of the reference spectrum data and each of shifted versions of the normalized measured spectrum data, and (ii) identifying one of the shifted versions of the normalized measured spectrum data for which the calculated function yields a minimum value.

31. (Amended) A temperature-measuring system according to claim 2030, wherein the difference function comprises a least squares function.

32. (Original) A temperature-measuring system according to claim 29, wherein computing the amount by which the normalized measured spectrum data must be shifted comprises (i) determining a whole part representing an integer number of shift units, (ii)

determining a fractional part representing a fraction of a shift unit, and (iii) adding the whole and fractional parts together.

33. (Original) A temperature-measuring system according to claim 32, wherein determining the whole part comprises computing a least squares difference function of the reference spectrum data and each of shifted versions of the normalized measured spectrum data, and determining the fractional part comprises computing an extreme value function of the reference spectrum data and one of the shifted versions of the normalized measured spectrum data for which the least squares function yields a minimum value.

34. (Original) A temperature-measuring system according to claim 16, wherein the predetermined conversion criteria comprises a multiplicative factor representing a temperature difference per unit of shift.

(Original) A temperature-measuring system according to claim 35. wherein the multiplicative factor is determined by 34, calibration process that includes obtaining measured spectrum data at a known temperature different from the reference temperature, and dividing the difference between the known temperature and the reference temperature by an amount by which normalized spectrum data obtained at the known temperature must be shifted wavelength to yield shifted normalized spectrum data in which the characteristic is most similar to the same characteristic in the reference spectrum data.

36. (Original) In a temperature measurement system employing a fiber optic temperature sensor and an optical spectrum analyzer optically coupled to the temperature sensor, wherein the

temperature sensor produces reflected light across an optical spectrum including an optical wavelength at which an optical characteristic of the temperature sensor can be detected, and wherein the optical spectrum analyzer is operative to produce electrical signals representing the intensity of the reflected light from the temperature sensor across the optical spectrum, a method of generating a measured temperature value based on the electrical signals, comprising:

establishing reference spectrum data from the electrical signals when the system is operating at a predetermined reference temperature;

obtaining and normalizing measured spectrum data from the electrical signals when the system is operating at a measurement temperature;

computing an amount by which the normalized measured spectrum data must be shifted in wavelength to yield shifted normalized measured spectrum data in which the optical characteristic is most similar to the same optical characteristic in the reference spectrum data; and

using pre-established conversion criteria to convert the computed shift amount to the measured temperature value.

37. (Original) A method according to claim 36, wherein computing the amount by which the normalized measured spectrum data must be shifted comprises (i) calculating a difference function of the reference spectrum data and each of shifted versions of the normalized measured spectrum data, and (ii) identifying one of the shifted versions of the normalized measured spectrum data for which the calculated function yields a minimum value.

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(Original) A method according to claim 37, wherein the 38.

difference function comprises a least squares function.

39. (Original) A method according to claim 36, wherein computing

the amount by which the normalized measured spectrum data must be

shifted comprises (i) determining a whole part representing an

integer number of shift units, (ii) determining a fractional part

representing a fraction of a shift unit, and {iii} adding the whole

and fractional parts together.

(Original) A method according to claim 39, wherein determining 40.

the whole part comprises computing a least squares difference

function of the reference spectrum data and each of

versions of the normalized measured spectrum data, and determining

part comprises computing fractional an extreme

function of the reference spectrum data and one of the shifted

versions of the normalized measured spectrum data for which the

least squares function yields a minimum value.

(Original) A method according to claim 36, wherein the pre-41.

established conversion criteria comprises a multiplicative

factor representing a temperature difference per unit of shift.

42. (Original) A method according to claim 41, wherein the

multiplicative factor is determined by a calibration process

that includes obtaining measured spectrum data at a known

temperature different from the reference temperature,

dividing the difference between the known temperature and the

reference temperature by an amount by which normalized spectrum

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data obtained at the known temperature must be shifted in wavelength to yield shifted normalized spectrum data in which the optical characteristic is most similar to the same optical characteristic in the reference spectrum data.